

**WHAT IS CLAIMED IS:**

- 1. A bi-directional transceiver module based on a silicon optical bench, comprising:**  
an optical fiber for transmitting optical signals;  
at least a laser diode for emitting optical output signals of a specific wavelength,  
said optical output signals being transferred through said optical fiber;  
at least a signal detector for receiving optical input signals of specific wavelength  
from said optical fiber;  
at least a thin film filter placed between said laser diode or said signal detector  
and said optical fiber, for reflecting or inserting said optical input or output  
signals of a specific wavelength in order to change the light transmission  
path of said optical signals;  
at least an optical lens placed between said laser diode and said optical fiber for  
improving mode of optical field and light coupling efficiency between said  
laser diode and said optical fiber;  
a groove for guiding said optical output signal to said optical fiber, or guiding  
said optical input signal to said signal detector; and  
a silicon optical bench made of a silicon wafer, said silicon optical bench  
integrating said optical fiber, said laser diode, said signal detector, said thin  
film filter, said optical lens and said groove into a module using a packaging.
- 2. The module as claimed in Claim 1, wherein said packaging is a passive alignment packaging.**
- 3. The module as claimed in Claim 1, wherein said optical lens is a straight-cut flat-tip optical fiber.**
- 4. The module as claimed in Claim 1, wherein said optical lens is a slant-cut flat-tip optical fiber.**

5. The module as claimed in Claim 1, wherein said optical lens is a conic optical fiber lens.
6. The module as claimed in Claim 1, wherein said optical lens is an arch optical fiber lens.
7. The module as claimed in Claim 1, wherein said optical lens is a thermally-diffusion expand core fiber lens.
8. The module as claimed in Claim 1, wherein said optical lens is a gradient index lens.
9. The module as claimed in Claim 1, wherein said optical lens is a ball lens.
10. The module as claimed in Claim 1, wherein said optical lens is an aspheric lens.
11. The module as claimed in Claim 1, wherein the bottom of said groove near said signal detector is a slant surface for reflecting said optical input signal upward.
12. The module as claimed in Claim 1, wherein the receiving surface of said signal detector is downward.
13. The module as claimed in Claim 1, wherein slant surface at the bottom of said groove near said signal detector is coated with a thin film of highly reflective metal.
14. The module as claimed in Claim 1, wherein said groove is a V-shaped groove.
15. The module as claimed in Claim 1, wherein said groove is a V-shaped groove with flat bottom.
16. The module as claimed in Claim 1, wherein said groove is a U-shaped groove.
17. The module as claimed in Claim 1, wherein said groove is a U-shaped groove with flat bottom.
18. The module as claimed in Claim 1, wherein said groove is a necktie-shaped groove.

**19.** The module as claimed in Claim 1, wherein said groove is a rhombus-shaped groove.